AMENDMENTS TO THE CLAIMS

1. (Cancelled)

2. (Previously Presented) The apparatus of claim 12, further comprising a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

3. (Previously Presented) The apparatus of claim 12, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

4. (Previously Presented) The apparatus of claim 12, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of generally vertical slots; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having an inverted frusto-conical shaped wall with a plurality of annularly extending radial slots that slant upward relative to the common axis, wherein the primary flow passes through the vertical slots of the outer

baffle and then through the annular slots of the inner baffle to project radially inward and upward relative to the common axis along a plurality of diametrically opposed vectors.

5. (Previously Presented) The apparatus of claim 12 wherein the field shaping unit comprises a dielectric wall disposed within an outer wall of the reaction vessel and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

6. (Previously Presented) The apparatus of claim 12 wherein the field shaping unit comprises an annular wall in the reaction vessel, the annular wall being spaced radially inward of an outer wall to define a center opening centered on a common axis and the electrode compartment being between the annular wall and the outer wall such that the primary flow passes through the center opening and the secondary flow passes through the electrode compartment.

7. (Previously Presented) The apparatus of claim 12 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the reaction vessel, the first annular wall being spaced radially inward of an outer wall, and a second annular wall in the reaction vessel concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

8. (Previously Presented) The apparatus of claim 12 wherein:

the field shaping unit comprises -

a first annular wall in the reaction vessel centered on a common axis, the first annular wall being spaced radially inward of an outer wall of the reaction vessel,

a second annular wall in the reaction vessel concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment, and

a virtual electrode unit having a first partition and a second partition, the first partition having a first lateral section coupled to the first and second annular walls and a first annular lip projecting from the first lateral section to define an interior flow path for the primary flow, and a second partition having a second lateral section above the first lateral section and a second annular lip projecting from the second lateral section, the second annular lip surrounding the first annular lip to define an annular opening therebetween; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

9. (Previously Presented) The apparatus of claim 12, further comprising a distributor coupled to the reaction vessel, the distributor having a central outlet defining the first outlet and a plurality of outer outlets defining second outlets.

10. (Original) The apparatus of claim 9 wherein the distributor comprises:

an inlet for receiving the primary flow and an annular cavity coupled to the inlet, the annular cavity defining the central outlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to corresponding outer outlets.

11. (Original) The apparatus of claim 9 wherein the distributor comprises:

an annular body having a plurality of annular steps;

an inlet extending through the body for receiving the primary flow;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, and a plurality of lower orifices in a lower part of the plenum; and

a plurality of channels extending from the orifices to corresponding outer outlets at the steps of the annular body.

12. (Currently Amended) A reactor apparatus for electrochemical processing of microelectronic workpieces, comprising:

a reaction vessel;

a first outlet configured to introduce a primary flow of a first processing solution into the reaction vessel;

at least one second outlet configured to introduce a secondary flow of a second processing solution different than the first processing solution into the reaction vessel separate from the primary flow;

a dielectric field shaping unit in the reaction vessel to receive the secondary flow from the second outlet, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the reaction vessel, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an ion-membrane ~~interface member~~ carried by the field shaping unit downstream from the electrode, the ion-membrane~~interface member~~ being in fluid communication with the second flow in the electrode compartment, and the ion-membrane~~interface member~~ being configured to be at least substantially impermeable to ~~prevent selected matter~~ fluids of the secondary flow and the primary flow.~~flow from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.~~

13-21. (Cancelled)

22. (Currently Amended) A reactor for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

a reaction vessel;

a distributor in the reaction vessel, the distributor having a first outlet configured to introduce a primary flow into the reaction vessel and at least one second outlet configured to introduce a secondary flow into the reaction vessel separate from the primary flow;

a dielectric field shaping unit in the reaction vessel, the field shaping unit being configured to receive the secondary flow from the second outlet and contain the secondary flow separate from the primary flow through at least a portion of the reaction vessel, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an ion-membrane ~~interface~~ member in the reaction vessel downstream from the electrode, the ion-membrane ~~interface member~~ being in fluid communication with the secondary flow in the electrode compartment, and the ion-membrane ~~interface member~~ being configured to ~~prevent selected matter~~ be at least substantially impermeable to fluids of the primary flow and ~~of~~ the secondary

~~flow. from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.~~

23. (Original) The apparatus of claim 22, further comprising a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

24. (Original) The apparatus of claim 22, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

25. (Previously Presented) The apparatus of claim 22 wherein the field shaping unit comprises a dielectric wall disposed within an outer wall of the reaction vessel and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

26. (Previously Presented) The apparatus of claim 22 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the reaction vessel, the first annular wall being spaced radially inward of an

outer wall of the reaction vessel, and a second annular wall in the reaction vessel concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

27. (Previously Presented) The apparatus of claim 22 wherein:

the field shaping unit comprises -

a first annular wall in the reaction vessel centered on a common axis, the first annular wall being spaced radially inward of an outer wall of the reaction vessel,

a second annular wall in the reaction vessel concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment, and

a virtual electrode unit having a first partition and a second partition, the first partition having a first lateral section coupled to the first and second annular walls and a first annular lip projecting from the first lateral section to define an interior flow path for the primary flow, and a second partition having a second lateral section above the first lateral section and a second annular lip projecting from the second lateral section, the second annular lip surrounding the first annular lip to define an annular opening therebetween; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

28. (Original) The apparatus of claim 22 wherein the distributor comprises:

an inlet for receiving the primary flow, the first outlet being in fluid communication with the inlet; and

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to a plurality of outer outlets, wherein the outer outlets define second outlets.

29. (Original) The apparatus of claim 22 wherein the distributor comprises:

an annular body having a plurality of annular steps;

an inlet extending through the body for receiving the primary flow, the first outlet being in fluid communication with the inlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, and a plurality of lower orifices in a lower part of the plenum; and

a plurality of channels extending from the orifices to a plurality of outer outlets at the steps of the annular body, the outer outlet defining second outlets.

30-47. (Cancelled)

48. (Currently Amended) A reaction vessel for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

a container having an upper portion with a workpiece processing zone;

a plurality of compartments in the lower portion of the container including at least a first electrode compartment and a second electrode compartment separate from the first electrode compartment through at least a portion of the container, the electrode compartments being configured to contain an electrochemical processing solution;

a plurality of separate electrodes including at least a first electrode in the first electrode compartment and a second electrode in the second electrode compartment;

at least a first ion-membrane between the first electrode and the workpiece processing zone, the first ion-membrane being configured to allow selected ions to pass across the first ion-membrane; and

a fluid flow system configured to direct a first fluid flow through the first and second electrode compartments and to direct a second fluid flow through the upper portion of the container, wherein the ion-membrane separates the first fluid flow from the second fluid flow and is at least substantially impermeable to fluids of the first fluid flow and the second fluid flow.

49. (Previously Presented) The reaction vessel of claim 48, further comprising a second ion-membrane at the second electrode compartment between the second electrode and the workpiece site, and wherein the second ion-membrane is configured to allow the selected ions to pass across the second ion-membrane.

50. (Original) The reaction vessel of claim 48, further comprising:

a first annular wall inside the container and a second annular wall inside the container, the second annular wall being between the first annular wall and the outer wall, and wherein a first annular space between the first annular wall and the second annular wall defines the first electrode compartment and a second annular space outside of the second annular wall defines the second electrode compartment; and

wherein the first electrode is a first annular electrode in the first electrode compartment, and the second electrode is a second annular electrode in the second electrode compartment.

51. (Previously Presented) The reaction vessel of claim 48, wherein:

the reaction vessel further comprises a first annular wall inside the container and a second annular wall inside the container, the second annular wall being between the first annular wall and the outer wall, and wherein a first annular space between the first annular wall and the second annular wall defines the first electrode compartment and a second annular space outside of the second annular wall defines the second electrode compartment; and

the first electrode is a first annular electrode in the first electrode compartment, and the second electrode is a second annular electrode in the second electrode compartment.

52. (Cancelled)

53. (Cancelled)

54. (Previously Presented) The reaction vessel of claim 48 wherein the first ion-membrane is impermeable to fluids in the processing solution.

55. (Previously Presented) The reaction vessel of claim 48 wherein the first ion-membrane is permeable to fluids in the processing solution.

56. (Previously Presented) The reaction vessel of claim 48, further comprising:

a dielectric field shaping unit in the reaction vessel configured to receive the processing solution, the field shaping unit having first and second walls

configured to define the first and second electrode compartments, and the first wall having an opening.

57-64. (Cancelled)

65. (Currently Amended) An apparatus for electrochemically processing a microelectronic workpiece, comprising:

a processing station comprising -

a head assembly having a contact assembly configured to hold a microelectronic workpiece in a processing position and a plurality of contacts configured to contact a portion of the workpiece in the processing position; and

a processing chamber having a reaction vessel;

a first outlet configured to introduce a primary flow of a first processing solution into the reaction vessel;

at least one second outlet configured to introduce a secondary flow of a second processing solution different than the first processing solution into the reaction vessel separate from the primary flow;

a dielectric field shaping unit in the reaction vessel coupled to the second outlet to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the reaction vessel, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an ion-membrane ~~interface member~~ carried by the field shaping unit downstream from the electrode, the ion-membrane ~~interface member~~ being in fluid communication with the second flow in the electrode compartment, and the ion-membrane ~~interface member~~ being configured to be at least substantially

impermeable to ~~prevent selected matter~~ fluids of the secondary flow and ~~from passing to~~ the primary flow.

66-92. (Cancelled)